2001 Trial Transcripts Part 6

variable changed as a function of [14] guide vane position according to a predetermined [15] schedule.

[16] The way in which inlet guide vane [17] position is used in the APS 3200 is through logic, [18] which recognizes a high-flow condition, which is [19] not connected with surge control at all, but [20] simply maintains the surge control system [21] essentially inoperable during the high flow [22] condition.

[23] And the result is that in the case [24] of the APS 3200 — in the case of the patent, each

Page 1414

[1] guide vane position will have the flow controller [2] controlling a different value of flow as required [3] to keep the compressor out of surge.

[4] The result of the IGV position being [5] used in the APS 3200 is to prevent the surge [6] controller from moving the bleed valve at all.

[7] **Q:** All right. Mr. Shinskey, let's look at [8] another element of Claim 8 to see if that is [9] satisfied in the APS 3200, and that's element D. [10] That says, "Sensing means for sensing the value of [11] a predetermined, flow-related parameter within [12] said duct means and generating an output signal [13] indicative of said value, said value of said [14] flow-related parameter being substantially [15] independent of the temperature of the compressed [16] air."

[17] Is that requirement satisfied in the [18] APS 3200?

[19] **A:** No, in fact, it's not. The APS 3200 uses [20] the DELPQP parameter to control surge and that is [21] not independent of the temperature of the air. [22] And we can tell this because it is necessary to [23] change the set point of the surge controller in [24] the APS 3200 as air temperature changes.

Page 1415

[1] **Q:** Now, is the parameter that the APS 3200 [2] uses, which we call DELPQP or the static pressure [3] parameter, that is equivalent to the parameter [4] that's required by this element D?

[5] **A:** No, it's not.

[6] **Q:** If you could please explain why that's [7] your opinion?

[8] **A:** The DELPQP parameter includes compression [9] ratio as a component, which of course gives a rise [10] to this double solution curve.

[11] And while that parameter represents [12] approach to surge for a variety of guide vanes [13] positions, the approach to surge is sensitive to [14] temperature and therefore temperature is required [15] to adjust the set point of the surge controller.

[16] **Q:** Is that parameter used in the APS 3200 [17] interchangeable with the parameter that meets [18] element D in Claim 8?

[19] **A:** No, they are not interchangeable.

[20] **Q:** Why is that?

[21] **A:** Because they have fundamentally different [22] properties, especially as temperature changes or [23] as guide vane position changes in the compressor.

[24] **Q:** In your understanding of element D, what

Page 1416

[1] is the function of using a flow parameter whose [2] value is substantially independent of the [3] temperature of the compressed air?

[4] **A:** Well, the advantage of having a [5] flow-related parameter that is independent of [6] temperature is we do not need to include [7] temperature compensation in the control of that [8] parameter.

[9] **Q:** Is that function parameter used in the [10] APS 3200?

[11] **A:** No, it's not, because of the sensitivity [12] of the DELPQP parameter in the APS 3200, two [13] variations in temperature, we need to use [14] temperature as a set point function in the APS [15] 3200.

[16] **Q:** Thank you.

[17] Let's turn to Claims 10 and 11 of [18] the '893. That is chart 56 B. Let me ask you [19] about Claims 10 and 11. In your understanding, [20] are these claims dependent on Claim 8 of the '893 [21] patent?

[22] **A:** Yes, they are.

[23] **Q:** And in your understanding, if Claim 8 is [24] not infringed by the APS 3200, can Claims 10 and

Page 1417

[1] 11 be infringed?

[2] **A:** No, they could not be, because of Claims [3] 10 and 11 really include all the claims, all of [4] the elements of Claim 8.

[5] **Q:** And so do you have any conclusion with [6] respect to whether Claims 10 and 11 are infringed [7] by the APS 3200?

[8] **A:** My opinion is that neither Claim 10 nor [9] 11 is infringed.

[10] **Q:** Thank you.

[11] Why don't we turn to Claim 19 of the [12] '893 patent, that's chart 59.

[13] Let me read this claim. It states, [14] "A control system for assuring a substantially [15] constant minimum flow rate through a duct [16] receiving air discharged from a compressor or the [17] like having adjustable inlet guide vanes, the duct [18] having a supply outlet connected to [19] pneumatically-operated apparatus having a variable [20] supply air demand, the duct further having an [21] exhaust outlet, said control system comprising:

[22] (a) a flow regulating device adapted to be [23] positioned in the exhaust outlet and operable to [24] selectively vary air flow outwardly therethrough;

Page 1418

[1] (b) a sensing device having a sensing portion [2] adapted to be position in the duct to sense [3] therein a predetermined parameter related to the [4] air flow rate through the duct, said sensing [5] device further having an output portion."

[6] Let me stop with element B. In your [7] understanding what element B requires, is that [8] satisfied by the APS 3200?

[9] **A:** No, it's not. There is no sensing device [10] located in the duct that is used for surge control [11] in the APS 3200.

[12] **Q:** And is what the APS 3200 does do in terms [13] of measuring a variable the equivalent of what's [14] required by element B?

[15] **A:** No, because this element B requires a [16] parameter that is related to flow rate through the [17] duct, and of course the DELPQP signal reflects [18] compression ratio as much as it does flow rate.

[19] **Q:** Let me read on. Element C states, "An [20] adjustable set point comparator having an input [21] portion coupled to said output portion of said [22] sensing device, and an outlet adapted to generate [23] an error signal."

[24] Let me ask you, does the APS 3200

Page 1419

[1] have such a comparator?

[2] **A:** Yes, it does. At the input of the [3] controller.

[4] **Q:** And is that the comparator we've [5] discussed earlier that's shown in figure 12a of [6] the ECB specification?

[7] **A:** It is the same comparator, yes.

[8] **Q:** And in the APS 3200 — let me just read [9] on.

[10] Element D states, "A proportional [11] controller having an inlet coupled to said output [12] of said comparator and further having an outlet; [13] (e) an integral controller having an inlet coupled [14] to said outlet of said comparator and further [15] having an outlet; (f) a summer having a first [16] inlet coupled to said outlet of said proportional [17] controller, a second inlet coupled to said outlet [18] of said integral controller, and an outlet coupled [19] to said flow regulating device; and (g)", which [20] what is I would like to focus on, states, "A guide [21] vane position sensor and a function

generator [22] coupled in series between the inlet guide vanes [23] and said input portion of said comparator."

[24] Mr. Shinskey, is that element

Page 1420

[1] satisfied in the APS 3200?

[2] A: No, it's not. The guide vane position [3] signal does not — is not connected either through [4] a function generator or any other way coupled in [5] series between the guide vanes and in the input of [6] the comparator of said comparator in the APS 3200.

[7] Q: Can you show chart 32, please.

[8] When we read element C of Claim 19, [9] which said, "An adjustable set point comparator [10] having an input portion coupled to said output [11] portion of said sensing device, and an outlet [12] adapted to generate an error signal."

[13] Can you identify where that would be [14] in the APS 3200?

[15] A: Again, the comparator is this circle [16] here, which receives a set point as an input, [17] which receives the DELPQP surge variable as [18] another input and generates an error signal which [19] is output to the P and I controller.

[20] Q: And in element G of claim 19 states, [21] "Guide vane position sensor and a function [22] generator couple in series between the inlet guide [23] vanes in said input portion of said comparator."

[24] Is that present in the APS 3200?

Page 1421

1] A: No, it's not present.

2] Q: If you could explain why that's not so?

3] A: The set point which is set to 2 [4] comparator in the APS 3200 is generated is a [5] function of temperature and not guide vane [6] position. So it substitutes for the role of guide [7] vane position in the APS 3200, essentially [8] replaces guide vane position as an input.

9] Q: Now, is the APS 3200 in using inlet guide [10] vane position in another part of its control [11] logic, is that equivalent to what claim 19 (g) [12] requires in stating that a guide vane position [13] sensor and function generator coupled in series [14] between the inlet guide vanes and input portion of [15] said guide vane comparator?

6] A: No, the guide vane portion is not [7] connected.

8] Q: Looking at element G, what is the [9] function in the patent claim of having guide [20] vane position sensor and a function generator [21] coupled in series between the inlet guide vanes [22] and the input portion of said comparator?

3] A: The function is to change the set point [24] of the flow-related parameter as inlet guide vane

Page 1422

[1] position changes in the patent.

[2] Q: And again, is that function performed in [3] the APS 3200 by inlet guide vane position?

[4] A: No, it's not performed by inlet guide [5] vane position. It is performed by temperature, [6] however.

[7] Q: Can you compare in terms of way and [8] result what element G requires and what the APS [9] 3200 actually does?

[10] A: The way this operates is in the patent is [11] to send the guide vane position signal through a [12] function generator which produces a relationship [13] between the set point of the surge controller, [14] which is the desired value of flow and the [15] temperature.

[16] In the case of the — excuse me, in [17] the patent, the relationship is between the set [18] point of the surge controller and the guide vane [19] position. In the APS 3200, the guide vane [20] position instead is used in such a way as to [21] disconnect the PI controller from the bleed valve.

[22] Q: Now, I believe Mr. Muller in arguing that [23] element G was satisfied in the APS 3200 pointed to [24] something that he said was a comparator, and it

Page 1423

[1] was different than what he had pointed to as [2] satisfying element C.

[3] In your understanding, is that a [4] fair reading of the function that's required by [5] element G of Claim 19?

[6] A: No. I would say it's not a fair reading [7] because element G requires the connection to the [8] said input portion of said comparator, and [9] Mr. Muller pointed to a different device on [10] another diagram which was not even a comparator.

[11] Q: Why don't we turn to Claim 23 of the '893 [12] patent. That's chart 60, 60(a) or 60(b).

[13] Mr. Shinskey, in your understanding [14] is Claim 23 dependent on Claim 19?

[15] A: Yes, it is.

[16] The Claim 23 states that it uses [17] Claim 19 as a basis, and simply is an additional [18] term to add to what the elements of claim 19 would [19] be.

[20] Q: And in your understanding, is Claim 23 [21] infringed by the APS 3200?

[22] A: No. Claim 23 would not be infringed if [23] Claim 19 were not infringed.

[24] Q: All right. Mr. Shinskey, looking at all

Page 1424

[1] of the Honeywell patent claims that are being [2] asserted here and looking at how IGV position is [3] used in all of those claims, does inlet guide vane [4] position perform that same role in the APS 3200?

[5] A: No, it does not.

[6] Q: In the APS 3200, is there something else [7] that occupies that role that's required by IGV [8] position in the patent claims?

[9] A: The role of IGV in the patent claims is [10] to adjust the set point for the surge control [11] variable. And temperature plays that role in the [12] APS 3200.

[13] Q: With respect to an argument that the APS [14] 3200 does use inlet guide vane position in the [15] same way that the patents require and that the [16] 3200's use of temperature is just something extra [17] that can be ignored, do you have any opinion with [18] respect to that issue?

[19] A: The APS 3200 does not use guide vane [20] position in surge control. It simply is a [21] secondary test recognizing a high-flow condition [22] which locks out the surge control system or [23] maintains a locked out condition for the surge [24] control system.

Page 1425

[1] It does not help in surge control at [2] all.

[3] Q: And how is temperature used in the APS [4] 3200?

[5] A: Temperature is used to adjust the set [6] point of the surge controller so as to maintain [7] the compressor out of surge as temperature [8] variations take place.

[9] Q: Okay. We are a going to turn now to the [10] question of whether the Honeywell patents are [11] valid in light of the prior art that has been [12] identified in this case.

[13] Mr. Shinskey, let me ask you, did [14] you consider the question of whether the Honeywell [15] patent claims that are at issue in the lawsuit [16] were either anticipated by or made obvious by what [17] was already known in the field of surge control [18] for compressors as of the time more than a year [19] before the Honeywell patent applications were even [20] filed?

[21] A: I did consider that, yes.

[22] Q: And what was your conclusion on that [23] question?

[24] A: My conclusion was that there were many

Page 1426

[1] references of prior art that included all of the [2] elements that were claimed in the Honeywell [3] patent, and these — this prior art were [4] publications that predated the filing of the [5] application

for the Honeywell patents.

Q: Now, first of all, let's take a look at what the patent office itself found was already known in the field at the time the Honeywell patent applications were filed.

If you could, please, pull up chart No. 4.

Mr. Shinskey, could you explain what this chart shows with respect to what the patent office itself found was already known in the field of surge control?

A: Yes. On the left-hand side, we have Claims 48 and 49 from the application that was filed with the patent office. And these claims were not accepted by the patent office. And the claims that were allowed differed from the claims that were rejected on the basis that they had the provision for adjusting the set point of the surge controller or otherwise changing the output of the surge controller as a function of inlet guide vane

Page 1427

position.

Q: Just to explain to the jury, looking at the language in Claim 4, the language that's not highlighted, what does that correlate to with respect to what we see in the left-hand column?

A: Well, all the other elements are essentially the same. You can even see the same language, for example, subparagraph A is the same in both cases.

So the only distinction of the addition of the feature of adjustable guide vanes and the use of adjustable guide vanes in effecting the controllers's output.

Q: Let me show you what's called the file wrapper for the '194 patent, that's Defendant's Exhibit 12, and if we could walk through what is reflected there in this Claim 4 chart.

MR. HERRINGTON: Your Honor, may I approach the witness?

THE COURT: Yes, you may.

BY MR. HERRINGTON:

Q: Mr. Shinskey, first of all, could you identify what Defendant's Exhibit 12 is?

A: Yes. This appears to be the file wrapper

Page 1428

for the patent, and therefore, includes he examiners's comments and reasons for rejecting some of the claims and whatever amendments followed that.

Q: This is for the '194 patent? It even shows that in the top right corner of the first page?

A: Yes, it does.

Q: Why don't you turn to the page that has a Bates stamp number, HSB 401556.

A: I have that page.

Q: Looking at the claims that are numbered 48 and 49, does that correlate with what we've shown on chart four on the board there?

A: Yes. The wording in the file wrapper is the same as the wording that's on the screen.

THE COURT: The jury can't read it.

MR. HERRINGTON: Okay. We can make it bigger.

Is that better?

THE COURT: No, it's the size.

Q: Why don't we leave that up for a minute and let me ask you, what we have here on the left-hand side is Claim 48 as it was shown in a

Page 1429

patent claim that Honeywell originally tried to obtain from the patent office, is that correct?

A: That's correct.

Q: And did the patent office allow that claim?

A: No, the patent office did not allow Claim 48.

Q: And before we move on, if we could focus on Claim 49. Is Claim 49 another claim that Honeywell tried to obtain from the patent office?

A: Yes, it is. Claim 49 depends on Claim 48, but it is rejected as well.

Q: The patent office — did the patent office allow that claim?

A: No, the patent office did not allow the claim.

Q: Why don't we turn to HSB 401565.

Could you identify what that is, please?

A: I believe this is what is called office action, where the patent examiner lists which claims were rejected, which are objected to, and so forth.

Q: Okay. Let me ask you to turn to the

Page 1430

second page of that document, and I'll read from the first — the second full paragraph. Let me ask you, what is shown by the second page?

A: In the second page are the reasons for rejecting the claims which the examiner rejected.

Q: And I'm going to try — we're going to try to project this onto the screen. While we're waiting for that, let me read what the patent examiner stated in this office action. He states, "Shell," and if you understand what that refers to, what does "Shell" refer to?

A: Shell is the international oil company that has a patent relevant to the art.

Q: It states: Shell discloses a compressor control system including surge control passage 9 with valve 10, P and delta P sensor, dividing circuit 14 and controller 15. Controller 15 compares the quotion with circuit 15 with set point 16. Note that the controller in figure two has both proportional and integral action.

What does that last sentence refer to?

A: The last sentence refers to the fact that Shell in their patent was, claimed proportional

Page 1431

and integral control of the surge variable.

Q: And it goes on to state, "Moreover, Shell's system operate according to a method generally similar to that claimed."

Now, skipping over to the next page, the first full paragraph, we just referred to Claims 48 and 49 that Honeywell originally tried to obtain from the patent office, and here it states, "Claims 48 and 49 are rejected like claims 41 through 43 and 52 above in view of Louis. The Shell control system is obviously applicable to any dynamic compressor, including gas turbine driven compressor means such as those disclosed by Louis."

If you could please explain what you understand the patent examiner has stated here?

A: Well, the patent examiner says that the system as patented by Shell, the system —

MR. HERRINGTON: I'm sorry, we're not able to project this.

THE COURT: Is there — is this document available to the jury in the jury notebook?

MR. HERRINGTON: I believe it may be

Page 1432

in the jury book.

THE COURT: Why don't you take a moment and see.

MR. HERRINGTON: All right. We'll take just a moment.

BY MR. HERRINGTON:

Q: What we're reading from is in Tab I of the jury notebook. And looking in

[19] Now, this is one of the prior art [20] articles that we'll be relying upon, and it's in [21] Exhibit O of the jury book. We'll also be [22] projecting it on the screen as Mr. Shinskey walks [23] through the document.

[24] Mr. Shinskey, let me ask you first

Page 1439

[1] of all to tell us just the title and the date of [2] this periodical in which this article appears?

[3] A: The periodical is the Sulzer Technical [4] Review, it's published by Sulzer Corporation which [5] is the manufacturers of compressors in Europe. [6] And this was published in 1963.

[7] Q: Now, the Honeywell patent applications [8] were filed in 1981?

[9] A: That's correct.

[10] Q: Before we discuss this article, was this [11] article something that the patent office had [12] before it when it considered the Honeywell patent [13] claims?

[14] A: Well, there was no indication in the file [15] wrapper of references to this article by the [16] patent office.

[17] Q: Why don't we turn to the second page. [18] And if we could focus in on the top, if you could, [19] please, tell us the title of this article?

[20] A: The title is the control of [21] turbo-compressors, and turbo-compressors are [22] understood to include centrifugal compressors such [23] as we have in the APUs and also axial compressors.

[24] Q: And who is the author of this article?

Page 1440

[1] A: The author is a man by the name of Kempe [2] who worked for Sulzer at the time.

[3] Q: Now, does Mr. Kempe's article discuss [4] surge control for compressors were adjustable [5] inlet guide vanes?

[6] A: Yes, it does.

[7] Q: If you could please walk us through where [8] he discusses that?

[9] A: I believe we have to go to the next [10] page. Yes. And let me blow up this area of the [11] screen right here.

[12] In Figure 7, Mr. Kempe describes the [13] relationship between flow and the position of the [14] guide vanes as required to protect the compressor [15] from surge.

[16] The surge limit is shown here, [17] that's the surge limit. And each one of the [18] curves shown here represents a different guide [19] vane position.

[20] And his variable that's plotted [21] across the bottom of the chart here, the variable [22] Q is identified over here as the charge flow rate, [23] so this is a relationship between flow and guide [24] vane position.

Page 1441

[1] Q: Does Mr. Kempe's article specifically [2] show how to adjust the set point based on inlet [3] guide vane position?

[4] A: Yes, it does.

[5] In this diagram, Figure 8B, he shows [6] first of all a compressor with inlet guide vanes, [7] and this propeller looking device in the center of [8] the compressor is representative of the guide vane [9] device.

[10] And then circle number seven, he [11] identifies under the figure as a position [12] transmitter which sends the position of the inlet [13] guide vanes to the control system.

[14] He identifies device six as a [15] function relay which takes as an input the guide [16] vane position signal and converts that into a flow [17] set point.

[18] Then Kempe further, he has a flow [19] measurement on the discharge here, this is a flow [20] metering device which sends a flow-related [21] parameter to the surge controller. And the surge [22] controller appears right here. And then the surge [23] controller operates the bleed valve as a function [24] of variations in the measured flow and variations

Page 1442

[1] in the set point coming from the guide vane [2] position sensor.

[3] Q: Now, does Mr. Kempe also discuss this [4] system in the text of his article?

[5] A: It is described in the text as well, yes.

[6] Q: Can you show where that is?

[7] A: This section here describes the control [8] of compressors with adjustable guide vanes. And [9] previous to this, he's talked about the [10] relationships between variables in a compressor [11] which are necessary to keep the compressor from [12] surge, but he says the above laws don't hold good [13] for the surge limit in compressors with adjustable [14] guide vanes. The blowoff limit is a function of, [15] for example, guide vane setting here, guide vane [16] position setting.

[17] And the arrangement of surge control [18] system shown in Figure 8A, and then he shows [19] Figure 8B, and Figure 8B is the figure that we [20] have just looked at, and it says Figure 8B uses [21] the — for a set point taken during the guide vane [22] setting alpha, is the variable that he assigns to [23] the guide vane position.

[24] Q: Let me just ask you given the information

Page 1443

[1] that can be provided by adjusting the set point [2] based on guide vane position, would an engineer of [3] ordinary skill in this field be able to implement that feature in a surge control system?

[5] A: Yes.

[6] Q: Let's talk about Kempe's disclosure of [7] flow-related parameters. I think you needed that [8] in Figure 8B the flow related parameters are on [9] the discharge side of the compressor?

[10] A: That's correct.

[11] Q: Now, does Kempe discuss a parameter that [12] would be substantially independent of temperature?

[13] A: Yes, he does. On this same page. If we [14] look at this figure, Figure 6B, in this case what [15] we'll see is again a flow measuring device [16] indicated by an orphous and a signal going to a [17] box, that box is a divider, and a pressure [18] measurement also going to that same device N, and [19] he shows that flow is proportional to the ratio, [20] he says about the control shown in figure 6B, the [21] ratio of delta P, that's the pressure drop across [22] the orphous to P which is the total pressure [23] measured upstream of the orphous is shown in relay [24] seven, so relay seven makes that comparison and

Page 1444

[1] then the surge controller makes that reference to [2] seven by surge point and therefore controls surge.

[3] This calculation which is made and [4] the location of the measurement in the discharge [5] duct from the compressor is identical to what [6] appears in the Honeywell patent.

[7] Therefore, if the calculation and [8] the measurements are made in the same location, [9] and the claim in the Honeywell patent is that that [10] measurement is substantially independent of [11] temperature, then this measurement is as well.

[12] Q: Now, the Honeywell patent claims talk [13] about the use of a proportional and integral [14] controls for the surge control system.

[15] What type of controllers does the [16] Kempe article show for the surge control systems [17] that he discusses?

[18] A: Well, while he doesn't identify what type [19] of controller on these individual diagrams, in the [20] text in the paper and later figures, he identifies [21] all the controllers as PI or PI D controllers.

[22] We could see this on one of the [23] later pages where figure 13 and 14 appear. Here [24] is figure 13 and let me blowup figure 13, which is

Page 1445

[1] kind of a pictorial view of the surge [2] system.

[3] we have here identified figure 13 [4] as the surge control unit. And we identify the [5] controller as a PI D controller.

[6] Now, PI D, the D part is derivative [7] action, it's a third mode of the controller. And [8] whenever I'm controlling flow, I know I cannot use [9] derivative. It is not beneficial to the action of [10] a flow controller, so it's always set to zero, in [11] which case the PI D controller reduces to a PI [12] controller.

[13] Q: Does a PI D controller include the [14] functions of a PI controller?

[15] A: Yes, the PI D controller has all the [16] functions of the PI controller plus the derivative [17] action if one chooses to use it.

[18] Q: Now, Mr. Kempe's article doesn't discuss [19] using electronic control for the surge control [20] system?

[21] A: No, it doesn't.

[22] Q: By the time of the year before the [23] Honeywell patent applications were filed, would [24] that be something that would be known to an

Page 1446

[1] ineer of ordinary skill in this field?

[2] es, in 1963 when this article was [3] published, electronic control was in its infancy. [4] And not all of the components that are required in [5] a surge control system would be available [6] implemented electronically, but by the 1970's, [7] there was a complete line of components [8] available.

[9] And people who were skilled in the [10] art would recognize that electronic control was [11] faster and more accurate than pneumatic control. [12] So by the early '70's, all surge control systems [13] were implemented electronically.

[14] Q: Let's go to the page 16, which I think is [15] the third page in.

[16] Does Kempe's article discuss [17] generally the importance in a surge control system [18] of matching the set point with the surge line?

[19] A: Yes, he does. I think we have to go back [20] to page one to find that Excuse me. In fact, [21] it's the next page after this.

[22] Yes, let me blowup this section [23] here. Kempe says, "For economic reasons it is [24] important to keep the blow-off limit as near to

Page 1447

[1] surge limit as possible, in other words to [2] match the response curve of the surge control [3] device with the surge characteristic."

[4] Q: Now, Mr. Shinskey, stepping back, looking [5] at all these features that Kempe dispose, as [6] adjusting the set point using guide vane position, [7] using proportional integral controls, a flow-rated [8] parameter that's independent of temperature, does [9] the information that he provides give enough [10] disclosure so that an engineer of ordinary ability [11] in the field would be able to take what he's [12] showing and actually implement it in a surge [13] control system?

[14] A: Yes, definitely.

[15] Q: All right. Why don't we turn to our next [16] article, and that's Defendant's Exhibit 147, the [17] Warnock article.

[18] THE COURT: Before you do that, let [19] me pole the jury here. I misspoke earlier when I [20] said that we were going to be on our normal [21] schedule today.

[22] Ms. Preston advises me that I have a [23] meeting at 12 noon which leads to me to ask [24] whether you would like to take a morning break or

Page 1448

[1] work straight through until noon. We would break [2] from 12:00 until 1:15.

[3] Do you want to stay and work [4] straight through to 12:00?

[5] THE JURY: A short break.

[6] THE COURT: Why don't we take a [7] short ten-minute break right now. Okay.

[8] (A brief recess was taken.)

[9] THE COURT: Mr. Shinskey, take a [10] seat, please.

[11] (Jury entering the courtroom at [12] 11:15 a.m.)

[13] THE COURT: All right. We'll [14] continue. And we're going until noon and break [15] until 1:15.

[16] BY MR. HERRINGTON:

[17] Q: I think we left off with the Warnock [18] article, Defendant's Exhibit 147.

[19] Mr. Shinskey, could I ask you to [20] tell us the name of this article?

[21] A: Typical Compressor Control [22] Configurations.

[23] Q: And the author?

[24] A: Y.D Warnock.

Page 1449

[1] Q: Is — are you familiar with Mr. Warnock?

[2] A: Yes, I am.

[3] Q: Who is he — who was he?

[4] A: He was an application engineer at Warnock [5] Products Company, which is a competitor of my [6] company. He held a position within his company [7] similar to what I held in my company.

[8] Q: Was he a controls engineer?

[9] A: Yes.

[10] Q: Why don't we look at the top left corner, [11] I believe that shows a date. If you could please [12] explain what that reflects?

[13] A: Yes. This is copyright 1976, I.S.A. [14] I.S.A. Is the Instrument Society of America. And [15] A.C. is their annual conference which would have [16] been held in 1976.

[17] This article would be a print from [18] their proceedings of that conference.

[19] Q: And if you could, please, just describe [20] who attends an annual conference of the Instrument [21] Society of America?

[22] A: The I.S.A. is a professional society [23] which fosters the development of technology in [24] measurement and control systems applied to a

Page 1450

[1] variety of industries.

[2] They have representatives from — in [3] fact, they have divisions for the petroleum [4] chemical industries, pulp and paper, aerospace, [5] automotive, biomedical and so forth, and control [6] and instrument engineers from all of those [7] industries will attend their annual conferences.

[8] Q: What's the purpose of a paper that's [9] being delivered at this annual conference?

[10] A: The paper delivered at this conference [11] would be used by the presenter to show his [12] findings, his results, the technology that was [13] developed in his company to the rest of the [14] membership, so that they would be able to benefit [15] by and possibly use the technology presented in [16] the paper.

[17] Q: Before we discuss what the contents of [18] this article, was this article something that the [19] patent examiner had when he was considering the [20] validity of the Honeywell patents?

[21] A: I did not see this among the references [22] that the examiner cited, no.

[23] Q: Now, generally what is the subject of [24] this article?

Page 1451

[1] A: Well, in this article, Warnock tries to [2] cover the whole universe of compressor control [3] configurations regardless of the demands or the [4] applications of compressors. And therefore, he [5] shows many, many different systems, which apply to [6] different applications.

[7] Q: Does he discuss compressors with [8] adjustable inlet guide vanes?

[9] A: Yes, he does.

[10] Q: And where is that?

[11] A: He describes adjustable inlet guide vanes [12] in one of the later pages, it's figure 15, and [13] there is text associated with figure 15.

[14] Q: I don't know if I've said yet, I believe [15] this is at Tab P in the jury book.

[16] A: His figure 15 shows, in fact, a [17] compressor with a guide vane operator, as you can [18] see. The guide vane operator is right here. And [19] the guide vane operator happens to be driven by a [20] pressure controller.

[21] Then he shows a function block here [22] where the position of the guide vanes is used to [23] adjust the set point for the surge flow [24] controller.

Page 1452

[1] There is the set point and a surge [2] controller is identified here.

[3] Q: Is he depicting the adjustment of the set [4] point based on inlet guide vane position?

[5] A: Yes, he is. In essentially the same [6] manner as the patents, the position of the guide [7] vane signal goes through a function block, [8] converted into an equivalent flow of set point.

[9] Q: You mentioned that he also in his text is [10] describing this figure. Where is that?

[11] A: That appears on the page of the text that [12] begins with the description of what's happening in [13] figure 15.

[14] And I'll read the text, it says [15] "When changes in guide vane position introduce a [16] pronounced difference between the actual surge [17] line and the surge control line defined by a [18] particular surge control system, accuracy, in [19] fact, this is an important word," the accuracy of [20] the surge control can be improved by entering the [21] guide vane position into the system for [22] compensation."

[23] And then he goes on to describe how [24] figure 15 shows a flow surge control system with a

Page 1453

[1] set point generated by the guide vane loading [2] signal.

[3] Q: And what does that mean?

[4] A: Well, that means that the guide vane [5] position signal is characterized into a [6] corresponding set point change, so that the system [7] will be operated efficiently as possible, but [8] still kept out of surge for all the various [9] positions of the guide vanes.

[10] And he shows that this can be done [11] by straight line approximation or by a nonlinear [12] characterizing device and he's describing the [13] functional relationship between the guide vane [14] position and the set point.

[15] Q: Does Mr. Warnock's article have any [16] explanation or any figures explaining use to [17] adjust the set point based on inlet guide vane [18] position?

[19] A: Yes, if we can go back to the previous [20] page, I think figure 14, in fact, shows the [21] relationship.

[22] Yes, in figure 14, he relates, he [23] relates the flow meter differential pressure [24] measurement to the guide vane position, that each

Page 1454

[1] one of these points that appear on the — each one [2] of the points that appear on the graph represents [3] a surge point.

[4] And he shows how the surge point [5] will move as the guide vanes are moved, and [6] therefore we have to develop a control system that [7] has a surge control line, that is where we're [8] controlling flow on the safe side of the surge [9] points for all various guide vane positions.

[10] And he list them all from 70 degrees [11] rotation to zero.

[12] Q: And then he shows a surge control system [13] that adjusts the set point based on guide vane [14] position?

[15] A: Yes, he essentially is implementing the [16] function in figure 15, which we've already seen.

[17] Q: All right. Now, you talked about how the [18] Honeywell patent claims refer to the use of [19] proportional integral controls. What type of [20] controls does Mr. Warnock's article recommend for [21] a surge control system?

[22] A: Warnock specifies proportional plus [23] integral control. And that appears if you go back [24] to the text just under the heading figure 15, we

Page 1455

[1] go to the next piece of text over here. And so [2] he's talking about the surge controller as can be [3] seen at the very top, the heading is Surge [4] Control, then he talks about reset and describes a [5] proportional plus reset controller as his surge [6] controller.

[7] And "reset" is another word for [8] "integral". That was the word — the word [9] "reset" was developed earlier in the technology [10] and later it was identified as an integral mode, [11] so reset is very common used in industry.

[12] Then he goes on to describe how the [13] reset access is in the controller, then we can run [14] into a problem called "reset windup". And he goes [15] into disclosing how the controller can be [16] protected against this reset windup problem and so [17] you can see proportional and integral are part of [18] his scheme.

[19] Q: Does Warnock also discuss measuring a [20] flow-related parameter?

[21] A: Yes, of course he does. If we cou look [22] at figure 6(a).

[23] In figure 6(a), he shows a flow [24] measurement made on the discharge of the

Page 1456

[1] compressor, so we have discharge flow. Then [2] pressure measurement also made on the discharge to [3] the compressor. And then he shows a divider where [4] we divide one by the other.

[5] And in this case, his example shows [6] pressure divided by the differential pressure [7] across the flow meter. This is the inverse of the [8] flow-related parameter which is described in the [9] patents, however in this case the text Warnock [10] goes on to point out that we can calculate this [11] either as the pressure divided by the differential [12] pressure or as the inverse. This is a purely [13] arbitrary function. You can do it either one-way [14] or the other way. And either way produces the [15] same result.

[16] This is in essence the flow-related [17] parameter of the patents, and if the flow-related [18] parameter of the patents is independent of [19] temperature, then this flow-related parameter is [20] as wel

[21] Q: When you say here the flow-related [22] parameter of the patents, you're talking about [23] what?

[24] A: The flow-related parameter of the patents

Page 1457

[1] is PT minus PS over PT. The function that is [2] calculated in figure 6(a) is the inverse of that [3] parameter. But as I said in the text, Warnock [4] describes that it can be calculated either in this [5] way or as the inverse, either way produces the [6] same result.

[7] Q: Let's look at figure 15 for just a [8] moment.

[9] Now, in figure 15, Mr. Warnock is [10] showing measuring a flow parameter on the inlet [11] side of the compressor?

[12] A: Yes, he does.

[13] Q: Does he also discuss how that measurement [14] can be taken on the discharge side?

[15] A: He does. There is a section of this [16] paper where he discusses this relationship between [17] inlet and outlet flow measurements. And so one [18] can be replaced with the other, if com pensation —[19] and sometimes, com pensation isn't even necessary, [20] especially in constant speed compressors.

[21] Q: Now, some of the Honeywell patent claims [22] talk about using electronic

controls. Does [23] Warnock refer to using electronic equipment in the [24] control system?

Page 1458

[1] A: Yes, he does. I believe this is — this [2] text follows the discussion on the reset windup [3] protection. If we could go back to the text that [4] has —

[5] Q: I think it's page 12.

[6] A: Yes. Right at the very top, the first [7] full paragraph at the top talks about, he has [8] developed this method or described this method for [9] protecting the proportional plus reset controller [10] against windup. That method is — he names the [11] batch switch.

[12] And so he says, "The batch switch [13] system is available on a number of pneumatic [14] controllers as an option, and a number of [15] electronic controllers as a standard feature."

[16] So he does address electronic surge [17] control systems.

[18] Q: Now, looking back at the, Mr. Warnock's [19] introduction to his article on the first page, [20] does he discuss the importance of matching a set [21] point of a surge control system with where the [22] surge point would be?

[23] A: Yes, I believe he does. I think it's [illegible] here.

Page 1459

[1] Now, he addresses here, and this is [2] quite important, he addresses the economy of the [3] system. And he says since bypassing or blowing [4] off gas waste power, it's desirable to determine [5] surge flow as accurately as possible to avoid [6] bypassing while maintaining safe operation.

[7] However, he says, this is not a [8] simple matter. Surge flow for compressors is not [9] a fixed quantity, but is related to other [10] variables. And I'm going to underline here other [11] variables.

[12] And among those variables, of [13] course, would be inlet guide vanes. And speedy [14] and so forth. And so where other variables [15] substantially affect surge flow, they must be [16] measured and included in the surge system, and [17] that's the role of inlet guide vanes when they [18] were variable.

[19] He goes on to say, surge conditions [20] can be defined completely in terms of variables [21] other than flow. But the problem of defining [22] surge conditions has led to the development of a [23] wide [illegible] of systems.

[illegible] of course he shows many [illegible]

Page 1460

[1] of those systems in his paper.

[2] Q: I believe you already reviewed one of the [3] examples he shows is when a compressor has [4] adjustable guide vanes that the set point should [5] be adjusted based on the guide vane position?

[6] MR. PUTNAM: Objection, leading.

[7] THE COURT: Why don't you rephrase [8] it.

[9] Q: With respect to compressors that have [10] adjustable guide vanes, what does Mr. Warnock [11] show?

[12] A: Mr. Warnock's conclusion with adjustable [13] guide vanes, he uses the adjustable guide vanes to [14] set the set point of the surge controller and [15] therefore compensate for the guide vanes in their [16] affect on the location of the surge limit.

[17] Q: Now, Mr. Shinskey, we've talked about [18] Warnock disclosing data of the set point based on [19] inlet guide vane position, his reference to using [20] a flow-related parameter that would be to [21] temperature, to using, would an engineer of [22] ordinary skill read this article back in the late [23] 1970's be able to take what Warnock is describing [24] and implement it in a surge control system?

Page 1461

[1] A: Yes, he could.

[2] Q: Why don't we turn to the White article, [3] that's Defendant's Exhibit 6. This is Tab N in [4] the jury book.

[5] Mr. Shinskey, if you could, please, [6] tell us the title of the article?

[7] A: Surge Control for Centrifugal [8] Compressors.

[9] Q: Do you recognize the author?

[10] A: Yes, the author, M.H. White was a member [11] of the Foxboro Company at the same time I was, and [12] at the time the article was prepared.

[13] Q: And if you could, please, tell us the [14] journal in which this article was published?

[15] A: This article appeared in Chemical [16] Engineering magazine. Chemical Engineering [17] magazine, a technical magazine which serves the [18] chemical industry and the light industries, [19] different — wherever chemical technology is used, [20] and food processing, paper mills, hydrocarbons and [21] so forth, Chemical Engineering magazine is used.

[22] And it also includes technical [23] articles on controlling those processes in all of [24] those industries.

Page 1462

[1] Q: And are you familiar with generally the [2] circulation of this journal?

[3] A: It would be over 100,000, I would [4] believe. I have subscribed to Chemical [5] Engineering magazine for almost 50 years and some [6] of my articles have appeared in here as well.

[7] Q: Now, this particular article by [8] Mr. White, has this been cited in other [9] publications?

[10] A: Yes, in fact, Warnock does include White [11] as a reference in his article. And it is — this [12] article that he published here was — has been [13] used at the Foxboro Company as kind of a standard [14] for engineers in the work that they have done in [15] designing surge control for compressor.

[16] Q: I don't know if you mentioned yet, what [17] is the date of this article?

[18] A: December 25th, 1972.

[19] Q: That was before the that was before the [20] patents were applied for?

[21] A: Yes.

[22] Q: You reviewed the file wrapper for the [23] Honeywell patents. Was this article examined by [24] the patent office when they were considering the

Page 1463

[1] validity of the Honeywell patents?

[2] A: It is not among their references, no.

[3] Q: What is the subject of Mr. White's [4] article?

[5] A: Mr. White is trying to show engineers how [6] to design an efficient and safe surge control [7] system, again, for a variety of different [8] compressors.

[9] Q: Does he discuss surge control for [10] compressors that have adjustable inlet guide [11] vanes?

[12] A: Yes, he does.

[13] Q: Where is that?

[14] A: That's about four or five pages into the [15] paper.

[16] Yes, here it is. Inlet guide vanes [17] shown here. And he talks about constant speed [18] compressors which is, of course, the case in the [19] patent.

[20] Q: Let me just interrupt for a second. [21] That's page 60 of his article?

[22] A: Page 60.

[23] Q: Okay.

[24] A: Constant speed centrifugal and axial

Page 1464

[1] compressors being frequently equipped with [2] adjustable inlet guide vanes. So it appears right [3] here.

[4] And then he talks about addition [5] reply, axial compressors may have adjustable [6] stator blade, so he puts the stator blades of an [7] axial compressor into the same category inlet [8] guide vanes of a centrifugal compressor.

[9] He describes beside influencing the

[10] compressor output, moving these vanes also changes [11] the slope of the surge curve. There is a surge [12] line for each vane position, just as there is, for [13] example, for each inlet temperature.

[14] Q: Now, does Mr. White describe a system [15] where the set point is adjusted based on guide [16] vane position?

[17] A: Yes, he does. I believe it's his figure [18] nine that shows that. Now, figure nine, White [19] uses for two different purposes. And in his first [20] purpose, he describes automatic temperature [21] compensation for compressors where we are [22] compressing a gas over a very, very wide [23] temperature range.

[24] And in that case, if the temperature

Page 1465

[1] of the gas is variable, then White uses a [2] temperature measurement and sends that temperature [3] measurement into a calculation to adjust the set [4] point of the surge controller.

[5] Then he goes on after he's finished [6] with his discussion of temperature compensation, [7] he goes on to discuss what we do in the case of [8] inlet guide vane variation, and he uses the same [9] diagram to do double service here, so he doesn't [10] have to draw the diagram over again.

[11] And he replaces the temperature [12] input with IGV position, and he says the [13] functional relationship is quite similar, and in [14] this configuration, variations in the position of [15] the inlet guide vanes go on to adjust the [16] temperature — excuse me, adjust the set point for [17] the surge controller.

[18] Q: Does Mr. White's article provide a [19] description of what's shown in figure nine?

[20] A: Yes, the text immediately to the right of [21] figure nine on the same page I believe describes [22] that.

[23] He talks about, first of all, if we [24] don't put any compensation in for variable guide

Page 1466

[1] vanes, this could result in bypassing gas at times [2] when it is not required. And therefore, when [3] vanes are positioned from a manual station and not [4] frequently changed, it's possible to simply make [5] an adjustment manually.

[6] However, he says, when frequent [7] changes in vane position produce large variations [8] in the slope of the surge line, it is desirable to [9] make the changes in the setting automatically. [10] And then he goes on to say, using a system like [11] the one for automatic temperature compensation in [12] figure nine.

[13] So he says the signal for the [14] controller to the vane operator, which is an [15] indication of the position of the vane, instead of [16] temperature measurement, is fed into the analog [17] computer to adjust the ratio setting.

[18] Then he goes on to say, this [19] produces a linear relationship between the ratio [20] setting and the vane position that is not [21] precisely correct; however, the errors introduced [22] are usually small enough to be neglected.

[23] Q: Let me ask you about measuring the flow [24] parameter. Does White describe how to measure a

Page 1467

[1] flow parameter in the discharge side of the [2] compressor?

[3] A: Yes, he does. If we can back up, there [4] is a discussion on discharge line flow [5] measurement. Now, the discussion on discharge [6] line flow measurement begins on this page and [7] continues to the next page, but in the next page [8] he relates it specifically to the case — and [9] we've skipped a page here somehow.

[10] Q: Why don't I see if I can project it on [11] the Elmo.

[12] This is on page 61.61 doesn't have [13] a page number, but it's preceding 62.

[14] A: Can you lower it down just a little bit?

[15] Okay. This is the area of interest [16] right here. Can I still — can I still mark this [17] up, Stephanie? No. Okay.

[18] The paragraph that begins right in [19] the middle of the page here says, When the [20] compressor operates at constant speed, the [21] instrumentation can be further simplified, that [22] means we don't have to divide by temperature, [23] multiply by pressure and so forth.

[24] Under the condition the compress

Page 1468

[1] ratio is constant at the search point and [2] therefore the equation 33 reduces to a simple [3] proportionality between a flow measurement made at [4] the inlet which produces a signal H1 and a flow [5] measurement made at the discharge of the [6] compressor which produces a signal H2.

[7] And therefore, we can use a standard [8] control system, simply replace H1 with H2.

[9] Q: Now, the Honeywell patents talk about [10] using proportional integral controls in a surge [11] control system. Does Mr. White in his article [12] discuss using proportional and integral controls?

[13] A: Yes, he does. It's under the heading of [14] Instrumentation. If we look at the second [15] paragraph here, he says the surge controller [16] should have in addition to proportional and reset [17] functions.

[18] Q: This is on page 58 of the article.

[19] A: And then he goes on, he goes on [20] describe the need for windup p tection, referring [21] to batch featu which is the same terminology [22] that Warnock used in his system, in his paper.

[23] Q: Now, some of the Honeywell patent claims [24] refer to using electronic equipment, and does

Page 1469

[1] Mr. White refer to that as well?

[2] A: Yes, he does. If we look at the first [3] paragraph under this heading of instrumentation, [4] he says that the equipment can be either pneumatic [5] or electronic.

[6] Q: Looking at all the features we've [7] discussed, adjusting the set point based on inlet [8] guide vane position, measuring a parameter in the [9] discharge side of the compressor, using PI control [10] for the surge control system, and using electronic [11] equipment, would an engineer of ordinary ability [12] working in the period a year before the Honeywell [13] patents were applied for, be able to take the [14] White article and implement a surge control system [15] that uses those features?

[16] A: Yes, definitely.

[17] Q: Do you have any knowledge the White [18] article actually being used in that way?

[19] A: Oh, yes. The White article has been [20] used, again, by engineers at the Foxboro Company [21] to develop surge control systems.

[22] Q: Why don't we look at what's called the [23] Fallin article, that's our Exhibit No. 19. This [24] is Tab Q in the jury book.

Page 1470

[1] Mr. Shinskey, if you could please, [2] read the title of the article?

[3] A: Controls for an Axial Turbo Blower.

[4] Q: Who are the authors?

[5] A: The authors are Fallin and Belas, [6] employees of the Bethlehem Steel Corporation at [7] the time the article was published.

[8] Q: When was this article published?

[9] A: May 1968 is the date.

[10] Q: And in what journal was it published?

[11] A: This article was published in [12] Instrumentation Technology, which the Journal [13] of the Instrument Soci of America, published [14] monthly.

[15] Q: If you'll turn one page you'll see where [16] that's shown a little bit lower on the screen.

system match the surge line in order to economize the operation of the ...em.

... there any discussion of that in the Shell patent?

A: There is, on page 1, column 1, line 27, begins with "Since the bypassing or blow off of gas through the bypass or the blow-off line represents a loss, in any case a loss of power, the valve is only open when and insofar as it is necessary to avoid surging."

Page 1497

Q: Now, as we discussed, the patent office found that the Shell patent proposed proportional and integral controls?

A: Yes.

Q: For a surge control system?

A: Yes.

Q: Have you had an opportunity whether or not Shell does disclose that. It appears in figure two of the patent there is some text that describes it as well.

A: It's on page 2, and it's at the last paragraph on the first column of page 2.

Q: Okay. Thank you.

Going back to what we just read ... what Shell says about keeping the ...ing the bypass valve only when and insofar as it is necessary to avoid surging, how, if at all, does that relate to adjusting the set point based on guide vane position when a compressor has adjustable guide vanes?

A: Well, if — we know that as the guide vanes are moved the flow at which surge develops changes in accordance with the position of the guide vanes.

Page 1498

And since the Shell patent states the importance of the economy of the compressor to open the blow-off or bypass valve only when and insofar as necessary to avoid surging, then we see that if we didn't change the set point when the guide vanes are moved, then we will be — to protect the compressors against all possible surge conditions, then we must be venting or blowing off compressed air unnecessarily at lower guide vane positions.

Q: And does that translate into a motivation to use adjusting the set point based on guide vane position ... compressor has adjustable guide ...es?

A: That is definitely an economical motivation, yes.

Q: All right. Let me turn to what we call the Glennon patent, the '035 patent, that's Defendant's Exhibit 142.

Let me just ask you, Mr. Shinskey, if I could, identify the title of this patent?

A: Surge Control for Variable Speed Variable Geometry Compressors.

The connotation "variable geometry"

Page 1499

refers to adjustable guide vanes.

Q: This is Tab U in the jury book.

THE JUROR: Tab what?

MR. HERRINGTON: U.

BY MR. HERRINGTON:

Q: And if you could, please, identify the person to whom this patent was issued and the assignee of the patent?

A: The inventors are Timothy Gleeson, Theodore Sarphine, I believe, and it's assigned to the Sundstrand Corporation.

Q: I believe you may have misspoken. Is it Timothy Glennon?

A: Glennon, I'm sorry.

Q: And the assignee is?

A: Sundstrand Corporation.

Q: And if you could, please, identify what date this application for a patent was filed?

A: It was filed on September 14th, 1977.

Q: And when was the patent issued?

A: Issued August 7th, 1979.

Q: Now, does the Glennon patent contain a discussion of adjusting the set point based on inlet guide vane position?

Page 1500

A: Yes, it does. We'll have to move in to about the third or fourth — well, the next figure, or what is figure one on the next page shows the motivation for adjusting.

Here we have — some of the things we've seen before where the surge line varies with the position of guide vanes. And in this position, Glennon covers variable speed as well as variable guide vanes.

And so Glennon shows that as the guide vanes are changed from fully opened to fully closed, the surge point moves following the contour of the surge line.

And, therefore, it would be desirable to move the set point of the surge controller commensurate with the movement of the surge point.

Q: Is that shown in the Glennon patent as well?

A: The implementation is shown in the Glennon patent, yes. It's perhaps two or three more figures after this.

This is the one, yes. Here we have the IGV position is indicated here. The IGV

Page 1501

position is measured and then it goes through what's called a describing function.

The describing function is essentially the functionality that we see in the other patents relating or converting the position of the guide vane into a signal representing the corresponding flow as a set point for the controller.

And this is sent on to the comparator, which you'll see right here and in that way performs essentially the same role in the Glennon patent as we have seen guide vane positions in both the prior art and in the Honeywell patents.

Q: All right. Let me ask you about another Glennon patent that's Defendant's Exhibit 143. This is Tab V in the jury book.

And let me just maybe to move this through this a little more quickly. This is also a patent issued to Glennon and others and assigned to the Sundstrand Corporation?

A: That's correct.

Q: And the application date is September 14th, 1977, and this patent was issued on August

Page 1502

7th, 1979?

A: That's correct.

Q: And does this patent also have a discussion of adjusting the set point based on guide vane position?

A: Yes, it does.

Q: Maybe just quickly identify the figures where that is?

A: Figure one again is very similar to the figure one in the previous patent. And shows a similar relationship to the position of the guide vanes and the surge point plotted in flow versus compression ratio.

Q: And then is there another figure actually shown?

A: Yes, there is another figure. And this figure shows more complex calculation than in the previous patent, but it also shows as well this input signal here, inlet guide vane and/or speed information, if employed.

So it shows the capability for bringing inlet guide vane position into the set point of the surge controller and again, the comparator appears right here, that's the same

Page 1503

[1] comparator that we've seen where the surge [2] variable is compared with the set point in the [3] other patents.

[4] Q: And this is figure three in the Glennon [5] patent, which is Exhibit 143?

[6] A: I think it's — yes, it is figure three, [7] it's shown up here.

[8] Q: Why don't we turn now to some other [9] articles in the prior art. If we could have [10] Defendant's Exhibit 16.

[11] This is Tab R in the jury book. [12] Mr. Shinskey, if you could, please, [13] just identify the title and authors of this [14] article?

[15] A: Parallel Compressor Control, and it is [16] written by A.E. Nisenfeld and Cho of Fisher [17] Control Company.

[18] Q: The date in the bottom left is a little [19] cut off in the copy I have but do you know what [20] date this was published?

[21] A: Yes. This was published in November of [22] 1976, I believe, in Instrumentation Technology.

[23] Q: And I think you discussed Instrumentation [24] Technology earlier, if you could briefly identify

Page 1504

[1] that journal?

[2] A: Yes, Instrumentation Technology is the [3] Journal of the Instrument Society of America, [4] I.S.A.

[5] Q: Let me ask you with reference to this [6] article, Defendant's Exhibit 116, and I don't [7] think I asked, but the two Glennon patents we [8] discussed, were those patents and articles before [9] the patent office examiner when he was considering [10] the validity of the Honeywell patents?

[11] A: I don't see the Glennon patents listed as [12] references by the patent office, no.

[13] Q: Thank you.

[14] Looking at the article by Nisenfeld [15] and Cho, do you have any discussion of adjusting [16] the set point of the surge control system based on [17] inlet guide vane position?

[18] A: Yes, they do, in figure four.

[19] Figure four shows a very simple [20] schematic, but it has the various elements that we [21] have looked at in the past.

[22] Again, vane position is an input to [23] the surge control system. And it sets the set [24] point of the surge controller, this would be the

Page 1505

[1] set point here.

[2] The controlled variable to protect [3] the compressor against surge is the flow measured [4] on the discharge, and we see it going to a flow [5] controller, the flow controller manipulates the [6] recirculation valve in the case to protect against [7] surge.

[8] Q: Would the information in these Nisenfeld [9] and Cho article be enough to teach an engineer of [10] ordinary skill in this field how to use this [11] feature of adjusting the set point based on guide [12] vane positions in a surge control system?

[13] A: Yes.

[14] Q: All right. Why don't we take a look at [15] another Nisenfeld and Cho article, this one is [16] Defendant's Exhibit 17. This is Tab S in the jury [17] book. And again, if you could, please, identify [18] the title and authors and date of this article?

[19] A: Again the title is Parallel Compressor [20] Control by A.E. Nisenfeld and C.H. Cho, and it was [21] published in the Australian Journal of [22] Instrumentation and Control in December, 1977.

[23] Q: In your review of the file wrapper for [24] the two Honeywell patents, was this article

Page 1506

[1] something that was considered by the patent [2] examiner?

[3] A: No, it was not.

[4] Q: Does this article have a discussion of [5] adjusting the set point based on inlet guide vane [6] position?

[7] A: It does. It appears in figure four of [8] this article as well as the last.

[9] As you see, this diagram is [10] identical to the other one. These two [11] publications are very, very similar.

[12] Q: And let me ask you, would this diagram [13] enable an engineer of ordinary skill in his field [14] to practice what is shown there?

[15] A: Yes.

[16] Q: All right. Let me turn to another [17] Nisenfeld and Cho article. This is Defendant's [18] Exhibit 18. This is Tab T in the jury book.

[19] If you could, identify the title, [20] author, date and the journal of this article?

[21] A: Parallel Compressor Control, What Should [22] Be Considered. Again, the authors are A.E. [23] Nisenfeld and C.H. Cho. It was published in [24] Hydrocarbon Processing magazine in February of

Page 1507

[1] 1978.

[2] Q: And from your review of the file wrapper [3] of the Honeywell patent applications, did the [4] patent examiner have this article when he was [5] considering the validity of the patent [6] applications?

[7] A: There is no reference to it, no.

[8] Q: Does this article say anyth about [9] adjusting the set point bas upon guide vane [10] position?

[11] A: Yes, it does, and that appears again in [12] figure four. Right here. This diagram is [13] arranged a little differently, but the same [14] elements are here. We have vane position, taken [15] from the compressor, and sent by a transducer to [16] the set point of a surge controller.

[17] And the surge controller has the [18] pressure this time at the suction of the [19] compressor as opposed to the discharge.

[20] But again, we know that for constant [21] speed compressors the flow can be measured either [22] at the compression or the discharge.

[23] Q: Mr. Shinskey, having reviewed all of [24] these articles that were published more than a

Page 1508

[1] year before the Honeywell patent applications were [2] filed, I would like to take the claims of the [3] Honeywell patents and show how the articles match [4] up with the claims.

[5] If we could begin with the '194 [6] patent, that's Exhibit 3. And the last - the [7] second to the last page. Could yc look at the [8] very bottom of the column on the right.

[9] Let me ask you before we go through [10] each element of the claim, do you have an opinion [11] as to whether Claim 4 is anticipated by the Kempe [12] article?

[13] A: Yes, I believe it is.

[14] Q: By the Warnock article?

[15] A: Yes.

[16] Q: By the White article?

[17] A: Yes.

[18] Q: And by your book in combination [19] reprinting the Fallin article?

[20] A: Yes.

[21] Q: And do you have an opinion as to whether [22] by combining the prior art that the patent office [23] found, and when they examined the '194 patent, [24] with any one of these other articles that show

Page 1509

[1] adjusting the set point based on inlet guide vane [2] position what is claimed in Claim 4 would be [3] obvious to one of ordinary skill in the field?

[4] A: I agree.

[5] Q: Why don't I read the claims. "A method [6] of utilizing a compressor, a gas turbine engine to [7] power pneumatically-operated apparatus having a [8] variable inlet air flow demand, the com-

that [7] would have on the use of inlet guide vane [8] positions that had been used in that high flow?

[9] **A:** It would remove the inlet guide vane [10] position as an input to any part of the surge [11] control system.

[12] **Q:** And can you explain what affect this [13] would have on any possible claim of infringement [14] under the Honeywell patents?

[15] **A:** Well, because the guide vanes would no [16] longer play any part in the surge control logic [17] whatsoever, that would remove any suspected cause [18] of infringement.

[19] **Q:** And just to reiterate your opinion as to [20] whether the current system infringes the Honeywell [21] patents?

[22] **A:** No, I believe the current system does not [23] infringe Honeywell patents as it stands.

[24] **MR. HERRINGTON:** All right. Thank

Page 1554

[1] you, Mr. Shinskey.

[2] **THE COURT:** Mr. Putnam, you my [3] cross-examine.

[4] **MR. PUTNAM:** Thank you, Your [5] Honor. It may take me a minute to set up.

[6] **THE COURT:** Okay.

[7] **CROSS-EXAMINATION**

[8] **BY MR. PUTNAM:**

[9] **Q:** Good afternoon, Mr. Shinskey.

[10] **A:** Good afternoon.

[11] **Q:** You and I met for the first time, as I [12] recall, back last December when I had the [13] opportunity to take your deposition on a couple of [14] days; is that correct?

[15] **A:** That's correct.

[16] **Q:** Now, is it fair to say that the product [17] that is at issue here is auxiliary power units?

[18] **A:** Yes.

[19] **Q:** Am I correct, sir, that before this case, [20] you had never had any professional engagement that [21] related directly to auxiliary power units?

[22] **A:** That's correct.

[23] **Q:** So your professional career, I think as [24] Mr. Herrington elicited, has spanned more than

Page 1555

[1] four decades; is that correct?

[2] **A:** That's correct.

[3] **Q:** And this case is the first time that [4] you've had direct involvement with auxiliary power [5] units, correct?

[6] **A:** Correct.

[7] **Q:** Okay. Now, in fact, when I deposed you [8] back in December of 2000, you had never actually [9] seen the APS 3200 before; is that correct?

[10] **A:** That's correct.

[11] **Q:** All right. And also at the time that I [12] deposed you, you had never actually seen an APU go [13] into surge; correct?

[14] **A:** That's correct.

[15] **Q:** You never seen with your own two eyes an [16] APU go into surge; correct?

[17] **A:** Correct.

[18] **Q:** Am I right that you have never designed a [19] control system for an auxiliary power unit?

[20] **A:** That's correct.

[21] **Q:** And is it also true that you've never [22] designed a surge control system for an auxiliary [23] power unit?

[24] **A:** That's correct.

Page 1556

[1] **Q:** In fact, am I right that you have not [2] designed a control system of any type for use on a [3] commercial airplane during your career?

[4] **A:** That's correct.

[5] **Q:** In fact, would you agree with me, sir, [6] that you are not well-versed in all of the [7] operating modes in which an APU might be called [8] upon to operate in?

[9] **A:** I would say that's correct, yes.

[10] **Q:** Let me ask you some questions about the [11] relative level of experience you had throughout [12] the course of your career, sir.

[13] First of all, am I right that the [14] two industries in which you have had the most [15] experience in your career are the chemical and [16] plastics industry and the petroleum and refining [17] industry?

[18] **A:** That's correct.

[19] **Q:** Let me ask you about the power industry. [20] Would you agree that you've had more experience [21] with the power industry in your career than you've [22] had with the aircraft industry?

[23] **A:** That would be true.

[24] **Q:** All right. Would you agree with me that

Page 1557

[1] you had more experience in your career, sir, with [2] the food and beverage industry than you've had [3] with the aircraft industry?

[4] **A:** That's probably true as well.

[5] **Q:** In fact, am I right, sir, that you've [6] had, or you consider yourself as having had more [7] experience with the water and wastewater industry [8] than you've had before this case began with the [9] aircraft industry?

[10] **A:** That would probably be true as well, [11] yes.

[12] **Q:** Now, your testimony with Mr. Herrington [13] was divided, I guess into three sections, [14] infringement, patent validity, and this issue at [15] the end of alternative designs.

[16] And I basically want to address the [17] three issues in that order during this [18] cross-examination. Is that all right with you, [19] sir?

[20] **A:** That's fine.

[21] **Q:** You were first retained by Sundstrand in [22] this matter, as I recall from your deposition, in [23] about May 2000; is that correct?

[24] **A:** That's right.

Page 1558

[1] **Q:** And am I right that when you were first [2] retained, you initially thought that the only [3] thing at issue was patent validity, nothing to do [4] with infringement, just the validity of the [5] Honeywell patents; correct?

[6] **A:** I was first asked to look into the [7] validity issue, yes.

[8] **Q:** And the infringement issue, that came up [9] later during the course of your engagement; [10] correct?

[11] **A:** Correct.

[12] **Q:** Okay. When the infringement issue came [13] up, was it your understanding that what you were [14] supposed to do was not to form an independent [15] opinion on whether or not the APS 3200 infringed [16] the Honeywell patents, instead what you were to do [17] was to come up with the opinion that Sundstrand [18] was not infringing?

[19] **A:** I don't understand what you mean by an [20] independent opinion, or the distinction between [21] the two parts of the statement you just gave me.

[22] **Q:** Let me ask the question this way, sir.

[23] Did you come to understand that the [24] purpose of your retention on the infringement

Page 1559

[1] issue was specifically to provide an opinion for [2] Sundstrand that the APS 3200 does not infringe the [3] Honeywell patents?

[4] **A:** I don't quite understand the question. I [5] don't know exactly what you're driving at.

[6] **Q:** Let me try it again. Did there come a [7] time during the course of your retention and work [8] with Sundstrand where you came to understand that [9] another purpose of your retention was to provide [10] an opinion for Sundstrand that the APS 3200 does [11] not infringe

the Honeywell patents?

A: Yes, I believe that's true.

Q: The purpose of your retention was to provide the opinion that it did not infringe, is that what you're saying?

A: Yes, I believe so.

Q: Now,, it's clear from your direct testimony that you have read the Honeywell patents during the course of your engagement, correct?

A: Correct.

Q: Do you have copies up there or do you want me to give you —

A: I have copies of both patents, yes.

Q: Okay. Do you notice that all three of

Page 1560

the independent claims that are at issue, Claim 4 of the '194 patent, and Claims 8 and 19 of the '893 patent, that they all use at the start of them this word "comprising "did you notice that?

A: I remember seeing "comprising". I don't remember whether it applied to all three, but I did see it.

Q: Actually, let me ask Mr. Schlaifer to put up the very start of the '194 patent and to blowup the top step, and if you can see the word "comprising" at the start of Claim 4 of the '194 patent, sir?

A: I see that.

Q: And do you understand that "comprising" basically means the same as "including"?

A: Yes.

Q: All right. And if we look at Claim 8 of the '893 patent, Mr. Schlaifer, again, if you blowup the top part of the claim, do you see that also starts with this word "comprising" or "including"?

A: I see that.

Q: All right. And finally just to run through them all, the independent ones,

Page 1561

Mr. Schlaifer, if you would pull up Claim 19, do you see that, Mr. Shinskey, hat the last word on the lead-in phrase t the top of Claim 19 is also this word, " omprising"?

A: I see that.

Q: Am I correct that you understand hat since each of the Honeywell atent claims at issue uses this word, " omprising," it is still infringement if vhat Sundstrand is doing is everything that the Honeywell patents do and hen just adding an extra thing or wo?

A: I understand that.

Q: So if Sundstrand does everything any one of those patent claims does and then adds an extra step or an extra two steps, that's still infringement; correct?

A: Yes, I understand that.

Q: All right. Now, with that background, let me turn to specific claims that are at issue here. And I'm going to start with this inlet guide vane position item that the jury has heard so much about and that was mentioned frequently during your direct examination.

Would you agree with me, sir, that

Page 1562

each compressor like the compressor on the APS 3200, each compressor has its own unique characteristics?

A: I'm not sure I could agree with that. There are certainly compressors of the same model and the same size would have the same characteristics.

Q: Each compressor model has its own unique characteristics, would you agree with that?

A: I would agree with that.

Q: Would you agree with me also that each compressor model has its own set of surge set points?

A: Yes, I think that — I would except that statement.

Q: If I understood your testimony correctly, it's your understanding that for compressors like the APS 3200 with adjustable inlet guide vanes, the position of the IGV's will affect the point at which surge will occur, is that correct?

A: It would affect the flow and the compression ratio at which surge would occur.

Q: Okay. And in fact, I think you testified during your testimony on Friday that there is a

Page 1563

relationship between the flow, which would be the minimum to prevent surge, and the position of the guide vanes; is that correct?

A: That's correct.

Q: Now, I want to talk about the APS 3200 and its use of surge. And I actually wanted to put up for the jury, to start, a couple of the things that you said this morning because you noticed them and I thought they were pretty interesting.

Let me first put up a bit of testimony, we have to ask Mr. Schlaifer to help me out as well on the Elmo. This is testimony that you gave this morning in response to questions from Mr. Herrington, you said that the use of the inlet guide vane position in the APS 3200 has really nothing to do with surge control because it represents a high flow condition where there is no danger of surge whatsoever. Do you remember that testimony, sir?

A: Yes.

Q: And then a couple pages later on pages 1411 and 1412, you said, "The way in which inlet guide vane position is used in the APS 3200 is

Page 1564

through logic, which recognizes a high-flow condition, which is not connected with surge control at all." That was your testimony, right, sir?

A: That's right.

Q: All right. And then finally on this point, when Mr. Herrington asked you his final question on the topic, you said, "The APS 3200 does not use guide vane position in surge control. It simply is a secondary test recognizing a high-flow condition which locks out the surge control system or maintains a locked out condition for the surge control system. It does not help in surge control at all."

Now, that's what you told the judge and the jury, right, sir?

A: Yes.

Q: Okay. Now, let's look at some documents where Sundstrand describes its APS 3200 and its use of inlet guide vane position.

You may have seen this in your testimony, sir, but let me show it to you. And that is the electronic control box specifications, which has previously been marked as Honeywell PTX

Page 1565

63.

MR. PUTNAM: Your Honor, may I approach?

THE COURT: Yes.

MR. PUTNAM: I suspect Your Honor has had a couple of copies of these. I'm happy to hand up another one.

THE COURT: I have it right here.

BY MR. PUTNAM:

Q: Now, this is a document prepared by Sundstrand; correct?

A: Correct.

Q: And this is a document prepared by Sundstrand in which Sundstrand describes its control systems, more than just its surge control systems, but its control systems for the APS 3200; correct?

A: Correct.

Q: Now, sir, can I ask you to turn in the document to page number 118,